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The Relationship between Integrated Thinking and Financial Risk: Panel Estimation in a Global Sample

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Abstract: There is a growing interest in identifying the benefits that companies may have once they disclose financial and sustainability information in integrated reports. The aim of this study is to analyze the relationship between integrated thinking and reporting (ITR) and financial risk in nonfinancial companies worldwide. Data were collected mainly from the Refinitiv Eikon database for 7111 companies from 85 countries over the period 2017–2021. The focal industries are basic materials, consumer discretionary, consumer staples, energy, healthcare, industrials, real estate, technology, telecommunications, and utilities. Panel regression was used as a statistical procedure and random effects models are preferred. Hypotheses related to signaling theory are confirmed, as companies are interested in high-quality disclosures in integrated reports, reflecting a positive outlook and reduced financial risk. Our results show a negative relationship between ITR and the weighted average cost of capital, and a positive association between the main predictor and liquidity measured by the cash ratio. In addition, designing a compensation system linked to sustainability performance leads to a reduced cost of financing through debt and equity. Robustness tests were applied to the relationship between ITR and the weighted average cost of capital; the results show that stricter board oversight and holistic stakeholder management can decrease the average cost of capital and the financial risk for the company. This research is important for stakeholders looking to improve their knowledge about integrated reports and for practitioners seeking to enhance the quality of integrated reports and reduce the financial risk of companies.

Keywords: integrated reporting; integrated thinking; financial risk; cost of capital; liquidity

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1. Introduction

Companies are facing pressure in terms of adapting their business activities to a more transparent disclosure manner, considering different channels adopted by managers to disclose relevant information that affects stakeholders' perspectives. This is supported by the International Financial Reporting Standards (IFRS) Foundation through the International Integrated Reporting Framework (IFRS Foundation 2022) that has the following objectives: (1) improving the quality of information for capital financiers; (2) promoting a more efficient approach to corporate reporting that considers the material factors that may affect the ability of an entity to create value over time; (3) improving accountability for a broad base of capitals and promoting a proper understanding of their interdependence; (4) supporting integrated thinking alongside decision making, and corporate actions that focus on value creation (IFRS Foundation n.d.).

In the context of informational asymmetry between the company's stakeholders, managers are more interested in revealing information that reflects the profitability in the market, which may be a positive signal for investors in terms of future decisions (Chouaibi et al. 2022). Thus, voluntary disclosures can be used to signal the ability of companies to create financial returns (Fuhrmann 2019). Furthermore, integrated reporting disclosure may be used as a signal to investors that stakeholder engagement and high information

quality are valued within the company (Oktorina et al. 2022). Such disclosures are expected to reduce information asymmetry (Utomo et al. 2021).

However, Camodeca et al. (2018) noted that sustainability disclosures may not matter to investors in the case of 'cheap talk' models, which are formally known as cost-free signaling games with a tendency to favor only 'positive' messages. The results (Camodeca et al. 2018) showed that integrated reporting is mostly 'cheap talk' and does not provide verifiable sustainability disclosures. Nevertheless, considering the theoretical framework based on signaling theory, our objective is to determine if companies with a developed system of integrated thinking and reporting (ITR) offer signals to stakeholders in terms of reduced financial risk. Managing such risk represents a complex responsibility that requires a clear and concise plan to anticipate losses, using different indicators such as leverage, weighted average cost of capital, and the cash ratio.

In complex business environments, conventional financial reporting with a focus on historical data does not meet the expectations of stakeholders, who demand high-quality, value-relevant, and timely information. This leads to intellectual curiosity about the potential link between integrated reporting and core business decisions, such as corporate financing, reduced financial risks, and good controls over company liquidity (Lemma et al. 2019). As such, integrated reporting may be associated with high-quality future-oriented information, encompassing financial and nonfinancial perspectives (Dragomir et al. 2022). Our study fills a research gap in the literature by analyzing the influence of ITR on the financial risk of nonfinancial companies headquartered in different countries around the world.

Our research is motivated by the low number of studies on the relationship between ITR and financial risk within nonfinancial sectors such as basic materials, consumer discretionary, consumer staples, energy, healthcare, industrials, real estate, technology, telecommunications, and utilities. Also, we were interested in analyzing this relationship considering the introduction of executive compensation variables, one linked to sustainability and the other to long-term financial targets. The models represent an important contribution to the academic literature by adding to the limited body of research on ITR, specifically related to various measures of financial risk, such as company liquidity. The research objective is achieved through the results obtained by applying a panel regression analysis to 7111 companies from 85 countries for the period 2017–2021. These companies are relevant to our study because they have different measures of financial risk than banks or insurance companies.

The structure of this study is as follows. A brief review of the literature supports the hypotheses development process. Materials and methods are presented, including data sources, regression models, dependent variables, the main predictor, control variables, sample selection and data cleaning, and details on the statistical procedures used. The results contain descriptive statistics, correlations, regression results for the first three models, regression results for the following six models which include executive compensation linked to sustainability, respectively, linked to long-term financial targets, and robustness tests for the second model with company grouping by executive compensation linked to corporate social responsibility and total shareholder return. Finally, the last section presents discussions and conclusions.

2. Brief Literature Review and Hypothesis Development

Integrated reporting brings together financial and nonfinancial information (Raimo et al. 2021). Vitolla et al. (2020) considered integrated thinking a major innovation of the former International Integrated Reporting Council (IIRC), promoting various perspectives in the decision-making process, such as financial, social and environmental criteria. Integrated thinking can be considered a generative process, and integrated reporting discloses the result of this process. ITR can be described as a cycle, where reporting practice supports strategy development and vice versa (Adams 2017a). However, integrated thinking per se is not directly measurable for scientific purposes. Therefore, the quality and depth of

integrated reporting is a proxy for the holistic approach to addressing environmental and social challenges and creating value across the enterprise.

In previous studies, it was observed that there is an association between integrated reporting and different indicators, such as leverage, weighted average cost of capital, cost of equity, and cost of debt (Ross et al. 2017). We aim to analyze this relationship, considering leverage, weighted average cost of capital and liquidity—the three main pillars of financial risk on which the ITR system has an effect. Leverage represents an indicator that shows the value of assets purchased by the company using debt. The weighted average cost of capital refers to both sources of capital (equity and debt) that a company pays to finance its assets. Liquidity measured through the cash ratio shows the ability of a company to repay its debt with cash and short-term investments. All three indicators are linked, from different perspectives, to financing, as they are considered to represent complementary measures of financial risk.

In a study conducted on three African stock exchanges between 2006 and 2015, Conway (2019) found that financial performance and risk appeared to have decreased since the introduction of mandatory integrated reporting in South African companies. However, the study rejects the hypothesis that financial risk (proxied by leverage) decreased after the implementation of mandatory integrated reporting, due to significant time delays between the introduction and the appearance of benefits. A contrary result was obtained by Dey (2020), on 144 firm-year observations for Bangladeshi banks during the period 2013–2018. Companies with greater opportunity for growth were more likely to adopt an integrated reporting framework. Thus, growth opportunities may be assimilated with lower financial risk.

Lemma et al. (2019) showed that companies that published integrated reports had a lower level of leverage, in a study based on 832 firm-year observations drawn from companies listed on the Johannesburg Securities Exchange for the period 2009–2015. This effect may be partially offset by improving the quality of financial reporting. The findings also support the hypothesis that integrated reports help companies improve their information environment by reducing information asymmetry. However, Gal and Akisik (2020) noted that integrated reports without assurance may not provide sufficient benefits to shareholders. We formulate the following hypothesis:

H_1. *The relationship between leverage in nonfinancial companies and their integrated thinking and reporting is negative.*

Different studies in the literature highlighted the relationship between integrated reporting and weighted average cost of capital, respectively, its two components, cost of equity and cost of debt.

In a panel sample of 211 adopters from 31 countries during the period 2009–2017, counting 1455 observations, Vena et al. (2020) observed a negative relationship between integrated reporting and the weighted average cost of capital, as their evidence confirmed an average 1.4% decrease in the cost of capital for adopters. More importantly, Vena et al. (2020) showed that the effectiveness of integrated reporting is more prominent in countries with strong collectivist values, low power distance, and a high level of masculinity (Hofstede 2011), represented by the importance of financial success.

Vitolla et al. (2020) highlighted that the quality of integrated reporting has a significant negative relationship with the cost of equity in a sample of 116 international companies analyzed for 2016, located in five different regions, Africa, America, Asia, Europe and Oceania, and in nine different sectors. This negative correlation was explained by the fact that integrated reporting is an innovative procedure used to reduce the cost of equity. Similar findings were obtained by Salvi et al. (2022) when analyzing a balanced panel of 125 companies for the period 2017–2019, for the extent of disclosure of human capital in integrated reports. The results indicated that human capital disclosure significantly decreases the cost of capital, which means that firms can reduce the risk perceived by investors through enhanced integrated reports. In another study, Salvi et al. (2020) found

a significant negative relationship between intellectual capital disclosure and the cost of equity, in a panel analysis of 164 integrated reports.

Considering that the other component of the weighted average cost of capital is represented by the cost of debt, different results were noted in the literature. Raimo et al. (2022) found a negative relationship between integrated reporting quality and the cost of debt, in a sample of 399 observations pertaining to a balanced panel of 133 listed European firms for the period 2017–2019. Gerwanski (2020) noted that integrated reporting significantly decreases a firm's cost of debt, based on a European sample analyzed for the period 2015–2017, with 2196 firm-year observations. Furthermore, he observed that this effect is stronger for companies that record a lower environmental, social and governance (ESG) performance and it applies only to those companies operating in environmentally sensitive industries. The above considerations justify the formulation of the following hypothesis:

H_2. *The relationship between the weighted average cost of capital of nonfinancial companies and their integrated thinking and reporting is negative.*

We consider the cash ratio as a measure of financial risk through the perspective of liquidity. If a company does not have enough cash to meet its financial obligations, then it faces the liquidity risk (Allman-Ward and Allman-Ward 2007). To the best of our knowledge, there are no previous studies on the relationship between nonfinancial firms' liquidity and ITR. As such, our research aims to analyze this association, addressing the existing research gap. Thus, we hypothesize that:

H_3. *The relationship between the liquidity of nonfinancial companies and their integrated thinking and reporting is positive.*

Certain attributes of corporate governance can confound the influence of integrated thinking and reporting on financial risk. The holistic approach predicated on integrated thinking depends on board oversight. Many CEOs are very active in implementing a stakeholder management system with the added benefit of integrated reporting (Velte 2019). In this sense, long-term incentives for executives are a necessary ingredient of integrated thinking (Adams 2017b). However, CEO compensation incentives linked to financial performance or sustainability indicators can affect the firm's financing structure or its cash policies. Ikram et al. (2020) suggested that CEOs view sustainability projects as a way to promote stock volatility, thus potentially increasing their own compensation. These findings point to the following hypothesis:

H_4. *Executive compensation linked to financial or sustainability performance has a significant influence on financial risk.*

3. Materials and Methods

3.1. Data Source

This study is mainly based on data collected from Refinitiv Eikon (formerly Thomson Reuters—Asset 4). We chose Refinitiv as it represents an international database used frequently by researchers, containing comprehensive ESG data available on all industries, including historical financial data and transparent methodology on its official website.

The Refinitiv database was used in previous studies that focused on analyzing integrated reporting and companies' financial performance. In a literature review of 41 articles, Crous et al. (2022) identified three articles that used the Thomson Reuters—Asset 4 database to assess the integrated reporting framework and two articles using the same database for the ESG reporting variables. Previous studies relied on industry data collected from Thomson Reuters (Gerwanski 2020; Obeng et al. 2020, 2021) including those focused on the banking sector (Bătae et al. 2021; Esteban-Sanchez et al. 2017).

ESG, financial and macroeconomic data are incorporated in the variables used in this study, detailed in Table 1.

Table 1. Variable description.

Abbreviation	Description and Calculation	Source
ITR	*Integrated thinking and reporting* are proxied by the *CSR Strategy Score* from Refinitiv, which reflects the company's practices to communicate the integration of economic, social, and environmental dimensions into its daily decision-making processes.	Refinitiv Eikon
LEV	*Leverage* is computed as total debt divided by total assets. Total debt represents total debt outstanding, which includes notes payable/short-term debt, the current portion of long-term debt/capital leases, and total long-term debt. Total assets comprise tangible or intangible resources owned or controlled to produce value and are held to have positive economic value.	Own computation based on Refinitiv Eikon
WACC	*Weighted average cost of capital* represents a financial metric that is used to compute the company's cost of capital in which each category of capital is proportionately weighted. All sources of capital, including equity stock, preferred stock and debt are included in the value provided by Refinitiv.	Refinitiv Eikon
CASH	*Cash ratio* represents a liquidity measure and is computed as cash and short-term investments divided by short-term debt. According to Refinitiv, cash and short-term investments represent the sum of cash, equivalents, and short-term investments. Short-term debt was computed as the difference between total debt and long-term debt, in which the latter represents the sum of long-term debt and capital lease obligations.	Own computation based on Refinitiv Eikon
Log(TA)	*Company size* which is computed as the natural logarithm of total assets.	Own computation based on Refinitv Eikon
Log(Gdppc)	*Gross domestic product per capita*, which is determined as the natural logarithm of the sum of gross value added by all resident producers in the economy plus any product taxes and minus any subsidies divided by mid-year population.	World Bank
Rgrowth	*Revenue growth*, computed as the percentage change in total revenue recorded in the current year relative to total revenue from the previous year. According to Refinitiv, total revenue represents revenue from the company's operating activities after deducting any sales adjustments and their equivalents.	Own computation based on Refinitiv Eikon
Basic Materials	This industry contains chemicals, mineral resources, and other resources. This is the base category (with the default value of zero) in the regression model. The other industries are assigned binary variables.	Refinitiv Eikon(Industry Classification Benchmark)
Cons. Discretionary	This industry contains companies that provide products and services directly to consumers, and their purchasing habits are, in nature, non-cyclical (discretionary). It includes manufacturers and distributors of household durable goods, apparel, leisure equipment, home electronic devices, automotive and related parts, whereas the services companies are active in hotels, restaurants, retailers/e-retailers, and passenger transportation.	Refinitiv Eikon
Cons. Staples	This industry contains companies that provide products and services directly to consumers with purchasing habits that are cyclical in nature (staples). It includes companies that manufacture, distribute or retail food, beverages, other non-durable household goods including drug retailing companies, agriculture, farming, fishing, ranching and milling companies.	Refinitiv Eikon
Energy	This industry contains energy—fossil and fuels, renewable energy, and uranium.	Refinitiv Eikon
Healthcare	This industry contains healthcare services and equipment, pharmaceuticals and medical research.	Refinitiv Eikon
Industrials	This industry contains machinery, tools, heavy vehicles, trains and ships, aerospace and defense, professional and commercial services, diversified industrial goods wholesale, construction and engineering, transport infrastructure, passenger transportation services and freight and logistics services.	Refinitiv Eikon
Real Estate	This industry contains residential and commercial real estate investment trusts and real estate operations.	Refinitiv Eikon
Technology	This industry contains technology equipment, software and IT services, financial technology (fintech) and infrastructure.	Refinitiv Eikon
Telecommunications	This industry contains companies that own and operate telecommunication infrastructures to provide content delivery services, including manufacturers of telecommunication equipment and related components.	Refinitiv Eikon
Utilities	This industry contains companies that distribute electric, gas and water, including the ones that provide waste, recycle, and related environmental services.	Refinitiv Eikon
SustC	Executive compensation linked to corporate social responsibility (CSR) or sustainability targets. This is a binary variable (True/False). This indicator is part of the Management Score, not the CSR Strategy Score.	Refinitiv Eikon
LinkTSR	CEO compensation linked to total shareholder return (TSR). This is a binary variable (True/False). This indicator is part of the Management Score.	Refinitiv Eikon

3.2. Regression Models

To validate H_1, the following econometric model is proposed:

$$LEV_{it} = \beta_0 + \beta_1 ITR_{it} + \beta_2 Log(TA)_{it} + \beta_3 Log(Gdppc)_{gt} + \beta_4 Rgrowth_{it} + \beta_{5\text{-}13} Industry_{it} + u_i + e_{it}, \quad (1)$$

where leverage represents one of the financial risk indicators measured by *LEV* for company (*i*), in year (*t*); *ITR* represents the predictor detailed in Table 1, for company (*i*), in year (*t*); *Log(TA)* and *Rgrowth* represent control variables specific to the company (*i*), in year (*t*),

Log(Gdppc) represents a control variable specific to the country (*g*), in year (*t*), and *Industry* control variables refer to ten industries, *Basic Materials, Consumer Discretionary, Consumer Staples, Energy, Healthcare, Industrials, Real Estate, Technology, Telecommunications* and *Utilities*, for company (*i*), in the year (*t*); β_0 represents the constant, and $\beta_{1–13}$ are the coefficients of the predictor and control variables. The error term is composed of u_i (the individual random component) and e_{it} (the idiosyncratic disturbance).

To validate H_2, the following econometric model is proposed:

$$WACC_{it} = \beta_0 + \beta_1 ITR_{it} + \beta_2 Log(TA)_{it} + \beta_3 Log(Gdppc)_{gt} + \beta_4 Rgrowth_{it} + \beta_{5\text{-}13} Industry_{it} + u_i + e_{it}, \quad (2)$$

where the weighted average cost of capital represents another indicator to measure financial risk, for company (*i*), in year (*t*); *ITR* represents the predictor detailed in Table 1, for company (*i*), in year (*t*); *Log(TA)* and *Rgrowth* represent control variables specific to the company (*i*), in year (*t*), *Log(Gdppc)* represents a control variable specific to the country (*g*), in year (*t*), and *Industry* control variables refer to ten industries, for company (*i*), in the year (*t*); β_0 represents the constant, and $\beta_{1–13}$ are the coefficients of the predictor and control variables.

To validate H_3, the following econometric model is proposed:

$$CASH_{it} = \beta_0 + \beta_1 ITR_{it} + \beta_2 Log(TA)_{it} + \beta_3 Log(Gdppc)_{gt} + \beta_4 Rgrowth_{it} + \beta_{5\text{-}13} Industry_{it} + u_i + e_{it}, \quad (3)$$

where liquidity represents a financial risk indicator measured by the cash ratio (*CASH)* for company (*i*), in year (*t*); *ITR* represents the predictor from Table 1, for company (*i*), in year (*t*); *Log(TA)* and *Rgrowth* represent control variables specific to the company (*i*), in year (*t*), *Log(Gdppc)* represents a control variable specific to the country (*g*), in year (*t*), and *Industry* control variables refer to ten industries, for company (*i*), in the year (*t*); β_0 represents the constant, and $\beta_{1–13}$ are the coefficients of the predictor and control variables.

To validate H_4, indicators referring to executive compensation policies (*SustC* and *LinkTSR*) will be added, in turn, to each base model from (1) to (3). These binary indicators are expected to be correlated. Therefore, multicollinearity is avoided by adding each indicator separately to the base models. The respective models are as follows:

$$LEV_{it} = \beta_0 + \beta_1 ITR_{it} + \beta_2 Log(TA)_{it} + \beta_3 Log(Gdppc)_{gt} + \beta_4 Rgrowth_{it} + \beta_{5\text{-}13} Industry_{it} + \beta_{14} SustC_{it} + u_i + e_{it} \quad (4)$$

$$LEV_{it} = \beta_0 + \beta_1 ITR_{it} + \beta_2 Log(TA)_{it} + \beta_3 Log(Gdppc)_{gt} + \beta_4 Rgrowth_{it} + \beta_{5\text{-}13} Industry_{it} + \beta_{14} LinkTSR_{it} + u_i + e_{it} \quad (5)$$

$$WACC_{it} = \beta_0 + \beta_1 ITR_{it} + \beta_2 Log(TA)_{it} + \beta_3 Log(Gdppc)_{gt} + \beta_4 Rgrowth_{it} + \beta_{5\text{-}13} Industry_{it} + \beta_{14} SustC_{it} + u_i + e_{it} \quad (6)$$

$$WACC_{it} = \beta_0 + \beta_1 ITR_{it} + \beta_2 Log(TA)_{it} + \beta_3 Log(Gdppc)_{gt} + \beta_4 Rgrowth_{it} + \beta_{5\text{-}13} Industry_{it} + \beta_{14} LinkTSR_{it} + u_i + e_{it} \quad (7)$$

$$CASH_{it} = \beta_0 + \beta_1 ITR_{it} + \beta_2 Log(TA)_{it} + \beta_3 Log(Gdppc)_{gt} + \beta_4 Rgrowth_{it} + \beta_{5\text{-}13} Industry_{it} + \beta_{14} SustC_{it} + u_i + e_{it} \quad (8)$$

$$CASH_{it} = \beta_0 + \beta_1 ITR_{it} + \beta_2 Log(TA)_{it} + \beta_3 Log(Gdppc)_{gt} + \beta_4 Rgrowth_{it} + \beta_{5\text{-}13} Industry_{it} + \beta_{14} LinkTSR_{it} + u_i + e_{it} \quad (9)$$

3.3. The Dependent Variables

Three dependent variables are used to measure the financial risk of nonfinancial companies. Definitions and calculations are included in Table 1. Leverage and the average cost of capital have a direct relationship with financial risk, whereas the cash ratio has an inverse relationship with financial risk.

One of the variables used by Conway (2019) to assess firm risk is leverage (*LEV*), computed as total debt divided by total assets. The results obtained by Conway (2019) show that firms do not see a reduction in financial risk after the introduction of mandatory integrated reporting, and this is explained by the fact that there is a significant time delay between the adoption of integrated reporting and the appearance of any benefits in the companies' risk profile.

Lemma et al. (2019) also use leverage (*LEV*) as a dependent variable in their study, computed as the ratio of total liabilities to total assets. The analysis shows that highly leveraged companies are more likely to provide lower-quality financial reports. Higher leverage is negatively and significantly related to a firm's decision to publish integrated reports.

The weighted average cost of capital (*WACC*) was used by Vena et al. (2020) as the dependent variable. It includes different elements such as the cost of debt, cost of preferred stocks and cost of common equity.

Crous et al. (2022) performed a systematic literature review on nonfinancial reporting and company financial performance, and identified six studies that use the cost of capital as a financial performance indicator in relation to the integrated reporting framework or ESG reporting. Therefore, the predictor is expected to have a significant relationship to different measures of financial risk.

Regarding the cash ratio (*CASH*), Inaba (2021) conducted a panel regression analysis covering twenty advanced and emerging countries for the period 2007–2017. The author observed that higher cash ratios were associated with managers with worse ethical behavior, weaker investor protection, harsher auditing, and greater potential for companies to face issues when borrowing money from banks. However, although the trade-off between the costs and benefits of holding cash was analyzed in previous studies (Décamps and Villeneuve 2022), we did not observe previous research on the relationship between the cash ratio, as a measure of financial risk, and ITR. Therefore, our study aims to address this research gap.

3.4. The Main Predictor: Integrated Thinking and Reporting

Integrated thinking and reporting (*ITR*) are proxied by the CSR Strategy score in the Refinitiv database. This score represents a subdimension of the corporate governance pillar score, which is part of ESG performance. Relative to the methodology made available by Refinitiv, this score reflects the practice adopted by the company to communicate matters linked to economic, social and environmental aspects and to incorporate them in its decision-making process. This indicator is an aggregate of several items such as the existence of a sustainability committee, integrated strategy in the annual management discussion, stakeholder engagement, sustainability reporting, the adoption of the Global Reporting Initiative (GRI) guidelines, the assurance of sustainability reports, Global Compact signatory, and the company's contribution to each Sustainable Development Goal. The same composite score was used by several authors in the dedicated empirical literature (Obeng et al. 2020; Serafeim 2015; Maniora 2017; Baboukardos et al. 2021; and Zouari and Dhifi 2021).

As Akisik and Gal (2019) mentioned in their study on North American firms for the period 2011–2016, stakeholders are more interested in analyzing combined financial and social responsibility information in a single integrated report. Pavlopoulos et al. (2017) highlighted that the presentation of ESG information in a separate sustainable report has led to criticism that nonfinancial information is not prioritized and not considered as relevant as financial information. Financial and ESG information is included in integrated reporting, and, based on the findings obtained by Pavlopoulos et al. (2017), companies that adopt this framework are less likely to have an aggressive approach in earnings management.

The results mentioned by Raimo et al. (2022) show that companies that provide high qualitative integrated reports benefit from being financed by other third parties at better rates. Worldwide, leading companies disclose ESG initiatives regarding the employees, the community, and the natural environment in their business strategy, by adopting a comprehensive way of communication with stakeholders, such as the integrated report (Rivera-Arrubla and Zorio-Grima 2016). Thus, the development of strategies is based on a holistic understanding of relevant issues and their influence on the company's value creation process, which is materialized in the preparation of the integrated report.

IFRS Foundation (n.d.) mentions that integrated thinking leads to integrated decision making and actions that take into account the creation, preservation, or erosion of company value over the short, medium or long term. Also, the former International Integrated Reporting Council (IIRC 2013) defined integrated thinking as an active consideration of all the relationships between the operating and functional units of a company, and the capital used by the entity. The more integrated thinking is embedded in company activities, the

more naturally information will flow into management reporting and decision making, thus creating value. The created value is reported through the integrated report. This is confirmed by the results obtained by Baboukardos et al. (2021): integrated thinking is significant for reporting decisions regardless of the company's context.

3.5. The Control Variables

This study includes two types of control variables, company and country specific, that could affect the relationship between *ITR* and financial risk. Company size (*Log(TA)*), revenue growth (*Rgrowth*) and *Industry* represent the company specific control variables, and the gross domestic product per capita (*Log(Gdppc)*) is the macroeconomic variable.

Dey (2020) mentioned that larger companies are under greater pressure to legitimize their operations. Therefore, they are more prone to disclose environmental and social aspects. We expect that the level of integrated reporting practice would be affected by the size (*Log(TA)*) of the company, measured by the natural logarithm of total assets. Size was used as a control variable in previous studies in the literature (Lemma et al. 2019; Gal and Akisik 2020; Gerwanski 2020; Hoang et al. 2020).

Conway (2019) used industry (*Industry*) as one of the control variables in a study examining the impact of integrated reporting on the financial performance, risk and institutional shareholder of listed companies in South Africa. Relevant data was collected from Bloomberg's Global Industry Classification System. Gal and Akisik (2020) also included the industry as a control variable, in their model.

In the literature review on nonfinancial reporting and company financial performance, Crous et al. (2022) identified one article that used sales growth (*Rgrowth*) as a financial performance indicator, in relation to integrated reporting. Obeng et al. (2020) included a control variable represented by sales growth, computed as the annual growth in sales from the previous to the current period.

Two grouping variables are used to validate H_4 and to eliminate the confounding effect of CEO incentives. *SustC* refers to executive compensation linked to sustainability targets, and *LinkTSR* captures the existence of CEO compensation linked to total shareholder returns (TSR). Considering that sustainability targets are generally for the medium to long term, McGuire et al. (2019) found that the time horizon of CEO compensation reduces poor social performance. Refinitiv does not collect other indicators of executive performance sensitivity.

3.6. Sample Selection and Data Cleaning

Our initial sample contained 60,706 companies with data available for industries such as basic materials, consumer discretionary, consumer staples, energy, healthcare, industrials, real estate, technology, telecommunications, utilities and financial services for the period 2017–2021. A total of 16,549 companies belonging to the financial services industry were eliminated from our sample, as financial risk indicators related to this specific industry differ substantially compared to those of nonfinancial industries. This approach was also used by Gerwanski (2020) in a European study on integrated reporting and cost of debt, as differences were identified with respect to asset structure, financial leverage, accounting standards, disclosure, supervision, capital structure and financing costs applicable to the financial services industry.

To ensure that sufficient data are available to determine a consistent pattern, in our sample we considered only those companies that have a CSR Strategy score available for at least one year in our sample period of five years. Thus, by applying this filter, 37,046 companies were excluded. The final sample contained 7111 companies for the period 2017–2021. This is a global sample because it contains companies from 85 countries, without any exclusion, as analyzed by Refinitiv. Companies are the most numerous from the United States (1505), China (948), the UK (484), Japan (396), and Canada (299).

3.7. Statistical Procedures

We performed a data-cleaning process, eliminating outliers smaller than the second percentile and larger than the 98th percentile. As the statistical procedure, we used panel regression, as it has the advantage of being able to analyze data over long periods, in this study, the sample period being five years. Multivariate panel regression models were estimated in the R (version 4.1.3) statistical environment. A fragment of R code is presented in Algorithm A1 (Appendix A). For each regression, the descriptive statistics of the unbalanced panel are presented in the respective tables.

Random effects models are preferred because the panel is wide (many units, few periods) and unit-specific effects are assumed to be randomly distributed around a common mean value according to some unknown probability distribution. This panel estimation method has been used on similar panel data extracted from Refinitiv (Shakil et al. 2021; Habibniya et al. 2022). Unit-specific effects are time-invariant, but the model also allows for predictors to be time invariant (such as industry membership) (Benfratello 2014). Also, Bell and Jones (2015) consider that the random effects approach is 'nearly always preferable' over the fixed effects approach (p. 149). Instead of using dummy variables for each unit or period as in the fixed effects approach, cross-sectional and time-specific effects are included as error terms in the random effects model. The Breusch-Pagan Lagrange Multiplier (LM) test is used to determine whether random effects are significant in the panel data model compared to the pooled OLS model. The alternative hypothesis is that there are significant differences between units (that is, a panel effect). This hypothesis makes sense when comparing enterprises from different countries and cultural environments.

4. Results

4.1. Descriptive Statistics

The descriptive statistics are presented in Tables 2–4 and are obtained based on the availability of the data. The highest number of observations is available in 2020, the CSR Strategy score being, on average, more than 50% of the theoretical range (0–100). This ensures that the factor has sufficient variability, but not outliers. The sample companies have a wide range of scores for the *ITR* indicator for the entire period 2017–2021.

Table 2. Descriptive statistics for the *ITR* score by year.

Year	*ITR*		
	Valid	Mean	SD
2017	3166	50.76	28.34
2018	3810	50.89	28.49
2019	4827	50.84	28.43
2020	5997	50.85	28.29
2021	5562	51.45	27.99

Table 3. Descriptive statistics for the financial ratios used in the study.

Variable	Valid	Mean	SD	Min	Max	Skewness	Kurtosis
ITR	23,362	50.99	28.29	0.090	99.97	−0.048	1.809
LEV	27,065	0.275	0.162	0.003	0.711	0.307	2.443
WACC	32,166	0.068	0.031	0.015	0.161	0.506	2.891
CASH	29,564	17.54	53.72	0.043	528.2	5.426	37.01
Log(CASH)	29,564	0.957	1.844	−3.143	6.270	0.484	2.991
Log(TA)	28,392	21.78	1.496	18.35	25.29	−0.004	2.448
Rgrowth	33,207	0.110	0.228	−0.437	1.225	1.294	6.335
SustC	26,826	0.184	-	0 (False)	1 (True)	-	-
LinkTSR	26,666	0.440	-	0 (False)	1 (True)	-	-

Table 4. Descriptive statistics per industry.

Variable	*ITR* Mean (SD)	*LEV* Mean (SD)	*WACC* Mean (SD)	*CASH* Mean (SD)	*Rgrowth* Mean (SD)
Basic Materials	54.77 (29.44)	0.26 (0.15)	0.075 (0.032)	18.82 (57.20)	0.13 (0.25)
Cons. Discretionary	46.96 (27.48)	0.27 (0.17)	0.069 (0.029)	18.68 (52.78)	0.09 (0.22)
Cons. Staples	55.32 (28.61)	0.26 (0.15)	0.062 (0.030)	14.01 (48.01)	0.08 (0.19)
Energy	56.79 (28.02)	0.29 (0.17)	0.075 (0.033)	19.03 (54.81)	0.15 (0.33)
Healthcare	45.31 (27.82)	0.23 (0.17)	0.070 (0.031)	30.72 (71.36)	0.15 (0.23)
Industrials	49.89 (27.30)	0.27 (0.15)	0.069 (0.029)	14.49 (47.73)	0.09 (0.20)
Real Estate	50.46 (28.01)	0.37 (0.13)	0.055 (0.026)	10.67 (44.48)	0.12 (0.24)
Technology	45.62 (28.98)	0.20 (0.14)	0.076 (0.032)	27.55 (67.73)	0.16 (0.23)
Telecommunications	57.01 (28.15)	0.31 (0.17)	0.066 (0.031)	12.59 (46.33)	0.06 (0.19)
Utilities	60.10 (25.93)	0.38 (0.15)	0.053 (0.028)	5.74 (30.33)	0.08 (0.20)

In terms of the financial ratios, *ITR* and *CASH* are spread out over a wider range of values, whereas in the cases of leverage (*LEV*), the weighted average cost of capital (*WACC*), company size (*Log(TA)*) and revenue growth (*Rgrowth*), the data points tend to be closer to the mean of the data.

The wider range of values are related to cash ratio (*CASH*), for the *Healthcare* industry followed by *Technology*. For the variable *ITR*, the highest standard deviation can be found for the industries *Basic Materials*, *Technology* and *Consumer Staples*.

4.2. Correlations

ITR is significantly correlated with all three measures of financial risk (see Table 5), but the correlations are not high (below 0.30). Among the dependent variables, *LEV*, *WACC* and *CASH* are highly correlated. The negative correlation between *LEV* and the average cost of capital (*WACC*) means that companies must balance their leverage and the average cost of capital. It is rational to decrease the leverage when the cost of debt is higher. The negative correlation is thus explained by the fact that these indicators would vary in opposite directions. However, both leverage and the cost of capital are indicators of financial risk, but they tend to reach a balance within a company. The macroeconomic variable (*GDPpc*) has a small negative correlation with the weighted average cost of capital (*WACC*). This is expected, given that companies from richer countries also have cheaper access to financing. The association between *SustC* and *LinkTSR* is Cramér's phi of 0.328. This moderate correlation is the reason why we use *SustC* and *LinkTSR* separately as predictors. For all other factors, there is no significant risk of multicollinearity.

Table 5. Correlation matrix for the variables of interest.

Variables	*ITR*	*LEV*	*WACC*	*CASH*	*TA*	*Rgrowth*	*GDPpc*
ITR	1						
LEV	0.077 **	1					
WACC	−0.063 **	−0.234 **	1				
CASH	−0.062 **	−0.208 **	0.045 **	1			
TA	0.324 **	0.130 **	−0.149 **	−0.074 **	1		
Rgrowth	0.017 **	−0.054 **	0.063 **	0.028 **	−0.031 **	1	
GDPpc	−0.045 **	0.093 **	−0.274 **	0.084 **	0.043 **	−0.022 **	1

** $p < 0.01$. Degrees of freedom are above 19,000 for all pairwise correlations.

4.3. Regression Results for Models (1) to (3)

Equation (1) presents a multivariate regression model using *ITR* as the main explanatory variable, along with *Log(TA)* as a proxy for company size, and other control variables. The results are presented in Table 6. The variable *ITR* is not in a significant relationship with leverage (*LEV*). This suggests that companies which adopted the ITR system do not automatically decrease their financial risk. Thus any action on improving the integrated reporting framework will not impact the leverage of nonfinancial companies. H_1 is not confirmed.

Table 6. Panel regression results for leverage (*LEV*) as the dependent variable.

Dependent: *LEV*	**Model (1)**		
Factors	**Coefficient**	**Z-Value**	***p*-Value**
Intercept	−0.41012 ***	−12.2946	<0.0001
ITR	−0.000031	−0.8911	0.3728
Log(TA)	0.025363 ***	20.3882	<0.0001
Log(Gdppc)	0.011690 ***	5.7370	<0.0001
Rgrowth	−0.036219 ***	−13.2100	<0.0001
Cons. Discretionary	0.012314	1.6296	0.1031
Cons. Staples	0.004595	0.5143	0.6071
Energy	0.022638 *	2.3021	0.0213
Healthcare	−0.021114 *	−2.3019	0.0214
Industrials	0.008272	1.1499	0.2501
Real Estate	0.095737 ***	10.8583	<0.0001
Technology	−0.052725 ***	−6.2057	<0.0001
Telecommunications	0.035819 **	2.9523	0.0031
Utilities	0.102570 ***	10.1176	<0.0001
No. of companies	5810		
No. of observations	18,357	*unbalanced panel*	
No. of years	5		
Adj. R-Squared	0.10344		
Chi-sq. (df = 13)	1265.19 ***		<0.0001
Breusch-Pagan LM (df = 1)	16062 ***		<0.0001

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$. Industry set as reference: *Basic Materials*.

Regarding the control variables, company size (*Log(TA)*), GDP per capita (*log(Gdppc)*), and membership in some of the industries (*Energy*, *Real Estate*, *Telecommunications* and *Utilities*) are significant positive predictors for *LEV*, whereas revenue growth (*Rgrowth*) and other industries (*Healthcare* and *Technology*) are significant negative predictors of *LEV*.

The results of the regression model based on Equation (2) are presented in Table 7. *ITR* is found to have a significant impact on the weighted average cost of capital (*WACC*), for industrial companies, thus confirming H_2. This suggests that companies with a weaker system of integrated thinking and reporting have a higher financial risk, as the cost of capital is higher. Conversely, integrated thinking and reporting can decrease the cost of capital.

In respect to control variables, only one significant positive relationship is found between *WACC* and the *Energy* sector, whereas negative significant relationships are found in the case of *Log(TA)*, *Log(Gdppc)*, and binary variables indicating the *Consumer Discretionary*, *Consumer Staples*, *Healthcare*, *Industrials*, *Real Estate*, *Telecommunications* and *Utilities* sectors.

Equation (3) presents a multivariate regression model using *ITR* as an explanatory variable, along with *Log(TA)* as the proxy for company size, and other control variables. The results are shown in Table 8. *ITR* has a significant positive relationship with liquidity measured through the cash ratio (*CASH*), and H_3 is confirmed. This association supports the fact that companies with a developed ITR system have a higher cash ratio. Thus, higher liquidity leads to a lower financial risk for companies. This result is corroborated with the confirmation from model (2).

Regarding the control variables, company size (*Log(TA)*) and some of the industries (*Consumer Staples, Real Estate* and *Utilities*) are significant negative predictors for *CASH*, although GDP per capita (*log(Gdppc)*), revenue growth (*Rgrowth*) and other industries (*Consumer Discretionary, Healthcare* and *Technology*) are significant positive predictors for *CASH*.

Table 7. Panel regression results for the weighted average cost of capital (*WACC)* as the dependent variable.

Dependent: ***WACC***	**Model (2)**		
Factors	**Coefficient**	**Z-Value**	***p*-Value**
Intercept	0.25545 ***	46.9280	<0.0001
ITR	−0.000030344 ***	−3.4122	0.0006
Log(TA)	−0.0027735 ***	−13.2796	<0.0001
Log(Gdppc)	−0.011761 ***	−37.7358	<0.0001
Rgrowth	0.00040595	0.4853	0.6274
Cons. Discretionary	−0.0035704 **	−3.1695	0.0015
Cons. Staples	−0.015146 ***	−11.4102	<0.0001
Energy	0.005380 ***	3.6681	0.0002
Healthcare	−0.007472 ***	−5.4658	<0.0001
Industrials	−0.0027808 ***	−2.5940	0.0094
Real Estate	−0.015115 ***	−11.3836	<0.0001
Technology	0.0016822	1.3252	0.1851
Telecommunications	−0.011926 ***	−6.6495	<0.0001
Utilities	−0.020435 ***	−13.5524	<0.0001
No. of companies	5900		
No. of observations	18,545	*Unbalanced panel*	
No. of years	5	*Random effects*	
Adj. R-Squared	0.17032		
Chi-sq. (df = 13)	2294.08 ***		<0.0001
Breusch-Pagan LM (df = 1)	3850.70 ***		<0.0001

** $p < 0.01$, *** $p < 0.001$. Industry set as reference: *Basic Materials*.

Table 8. Panel regression results for the natural logarithm of the cash ratio (*CASH*) as the dependent variable.

Dependent: ***CASH***	**Model (3)**		
Factors	**Coefficient**	**Z-Value**	***p*-Value**
Intercept	2.19991 ***	5.8019	<0.0001
ITR	0.00105 *	1.9992	0.0455
Log(TA)	−0.17103 ***	−11.8590	<0.0001
Log(Gdppc)	0.24425 ***	10.9554	<0.0001
Rgrowth	0.20983 ***	4.6683	<0.0001
Cons. Discretionary	0.23241 ***	2.8692	0.0041
Cons. Staples	−0.20422 *	−2.1555	0.0311
Energy	0.09573	0.8873	0.3749
Healthcare	0.65228 ***	6.5691	<0.0001
Industrials	−0.05411	−0.7037	0.4816
Real Estate	−0.67994 ***	−6.7510	<0.0001
Technology	0.81474 ***	8.8764	<0.0001
Telecommunications	−0.09945	−0.7729	0.4395
Utilities	−0.89873 ***	−8.2979	<0.0001
No. of companies	5584		
No. of observations	17,150	*Unbalanced panel*	
No. of years	5	*Random effects*	
Adj. R-Squared	0.0604		
Chi-sq. (df = 13)	848.789 ***		<0.0001
Breusch-Pagan LM (df = 1)	8550.4 ***		<0.0001

* $p < 0.05$, *** $p < 0.001$. Industry set as reference: *Basic Materials*.

4.4. Regression Results for Models (4) to (9)

We were interested to see whether the introduction of executive compensation variables would change the results obtained for models (1) to (3). When financial risk is proxied

by leverage (*LEV*), the results are qualitatively the same (see Table 9). The *ITR* variable has no significant influence on the company's financing structure. However, linking executive compensation to sustainability or long-term financial targets would significantly increase the debt-to-asset ratio. This result suggests that long-term goals put more pressure on the executive team to bring in more cash from creditors to implement the company's strategy.

Table 9. Panel regression results for leverage (*LEV*) as the dependent variable in models (4) and (5).

Dependent: *LEV*	**Model (4)**			**Model (5)**		
Factors	**Coeff.**	**Z-Value**	***p*-Value**	**Coeff.**	**Z-Value**	***p*-Value**
Intercept	−0.39593 ***	−11.8402	<0.0001	−0.37032 ***	−10.9842	<0.0001
ITR	−0.0000486	−1.3965	0.162	−0.000055937	−1.5949	0.1107
Log(TA)	0.025103 ***	20.1523	<0.0001	0.024863 ***	20.0193	<0.0001
Log(Gdppc)	0.010717 ***	5.2376	<0.0001	0.008477 ***	4.0122	<0.0001
Rgrowth	−0.035754 ***	−13.0357	<0.0001	−0.035968 ***	−13.0755	<0.0001
Cons. Discretionary	0.012859	1.7019	0.0887	0.012918	1.7172	0.0859
Cons. Staples	0.0052883	0.5919	0.5539	0.0051969	0.5843	0.5590
Energy	0.023059 *	2.3423	0.0191	0.022681 *	2.3143	0.0206
Health care	−0.020685 *	−2.2551	0.0241	−0.020905 *	−2.2894	0.0220
Industrials	0.0087381	1.2146	0.2245	0.0087241	1.2177	0.2233
Real Estate	0.096493 ***	10.9441	<0.0001	0.096046 ***	10.9434	<0.0001
Technology	−0.052679 ***	−6.1901	<0.0001	−0.052821 ***	−6.2344	<0.0001
Telecommunications	0.035310 **	2.9065	0.0036	0.035927 **	2.9701	0.0029
Utilities	0.10256 ***	10.1237	<0.0001	0.10326 ***	10.2386	<0.0001
SustC	0.0099065 ***	5.5520	<0.0001	-	-	-
LinkTSR	-	-	-	0.011751 ***	5.2635	<0.0001
No. of companies	5791			5789		
No. of observations	18,300	*Unbalanced panel*		18,206	*Unbalanced panel*	
No. of years	5	*Random effects*		5	*Random effects*	
Adj. R-Squared	0.1048			0.1048		
Chi-sq. (df = 14)	1294.51 ***		<0.0001	1286.29 ***		<0.0001
Breusch-Pagan LM (df = 1)	16016 ***		<0.0001	15531		<0.0001

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$. Industry set as reference: *Basic Materials*.

The results on the weighted average cost of capital (*WACC*) are robust when adding the executive incentive factors (see Table 10). Executive compensation linked to sustainability targets does not confound the relationship between ITR and financial risk. The implementation of the ITR system will lead to a significant decrease in *WACC* and designing a compensation system linked to sustainability performance will have the same effect. These results show that a holistic approach to sustainable development will reduce the cost of financing through debt and equity. However, executive compensation linked to total shareholder return (*LinkTSR*) does not have a significant effect on the cost of capital.

The relationship between *ITR* and *CASH* is not affected by the introduction of the binary variable with respect to executive compensation linked to sustainability goals (see Table 11). Integrated thinking and reporting have a positive and significant impact on the cash ratio, although designing CEO incentives linked to sustainability targets (*SustC*) would lead to a higher level of financial risk. Regarding company liquidity, managerial incentives linked to social responsibility and environmental performance would lead to a higher use of cash resources and to a relative increase in company debt. Therefore, linking managerial incentives to sustainability would increase financial risk and affect the economic performance of the company. This result is confirmed by previous literature (Jian and Lee 2015).

Table 10. Panel regression results for the weighted average cost of capital (*WACC)* as the dependent variable in models (6) and (7).

Dependent: ***WACC***	**Model (6)**			**Model (7)**		
Factors	**Coeff.**	**Z-Value**	***p*-Value**	**Coeff.**	**Z-Value**	***p*-Value**
Intercept	0.25441 ***	46.5525	<0.0001	0.25558 ***	45.9663	<0.0001
ITR	−0.00002723 **	−3.0405	0.0023	−0.00003184 ***	−3.5383	<0.0001
Log(TA)	−0.0027836 ***	−13.294	<0.0001	−0.0027565 ***	−13.1560	<0.0001
Log(Gdppc)	−0.011616 ***	−36.8506	<0.0001	−0.011808 ***	−34.4374	<0.0001
Rgrowth	0.0003286	0.3923	0.6948	0.00049883	0.5927	0.5534
Cons. Discretionary	−0.0036545 **	−3.2393	0.0011	−0.0036042 **	−3.1970	0.0013
Cons. Staples	−0.015242 ***	−11.4634	<0.0001	−0.01.5156 ***	−11.4098	<0.0001
Energy	0.0054266 ***	3.6905	<0.0001	0.005314 ***	3.6165	<0.0001
Healthcare	−0.007563 ***	−5.5253	<0.0001	−0.0075141 ***	−5.4940	<0.0001
Industrials	−0.0028371 **	−2.6423	0.0082	−0.0027729 **	−2.5837	0.0097
Real Estate	−0.015167 ***	−11.4054	<0.0001	−0.015176 ***	−11.4235	<0.0001
Technology	0.0016229	1.2738	0.2027	0.0018034	1.4166	0.1565
Telecommunications	−0.012030 ***	−6.6891	<0.0001	−0.012023 ***	−6.6760	<0.0001
Utilities	−0.020385 ***	−13.5080	<0.0001	−0.020452 ***	−13.5551	<0.0001
SustC	−0.0016535 **	−3.2107	0.0013	-	-	-
LinkTSR	-	-	-	0.00020488	0.3738	0.7085
No. of companies	5881			5878		
No. of observations	18,484	*Unbalanced panel*		18,386	*Unbalanced panel*	
No. of years	5	*Random effects*		5	*Random effects*	
Adj. R-Squared	0.1706			0.1703		
Chi-sq. (df = 14)	2296.44 ***		<0.0001	2289.42 ***		<0.0001
Breusch-Pagan LM (df=1)	3845 ***		<0.0001	3668.3 ***		<0.0001

** $p < 0.01$, *** $p < 0.001$. Industry set as reference: *Basic Materials*.

Table 11. Panel regression results for the natural logarithm of the cash ratio (*CASH*) as the dependent variable.

Dependent: ***CASH***	**Model (8)**			**Model (9)**		
Factors	**Coeff.**	**Z-Value**	***p*-Value**	**Coeff.**	**Z-Value**	***p*-Value**
Intercept	2.16310 ***	5.6832	<0.0001	2.45327 ***	6.3637	<0.0001
ITR	0.00118 *	2.2208	0.0263	0.00081	1.5195	0.1286
Log(TA)	−0.17155 ***	−11.8671	<0.0001	−0.16970 ***	−11.7476	<0.0001
Log(Gdppc)	0.24984 ***	11.1114	<0.0001	0.21274 ***	8.9395	<0.0001
Rgrowth	0.20970 ***	4.6557	<0.0001	0.21538 ***	4.7750	<0.0001
Cons. Discretionary	0.22897 **	2.8227	0.0047	0.23349 **	2.8818	0.0039
Cons. Staples	−0.20494 *	−2.1598	0.0307	−0.20112 *	−2.1222	0.0338
Energy	0.09299	0.8597	0.3899	0.08361	0.7739	0.4389
Healthcare	0.65352 ***	6.5724	<0.0001	0.65815 ***	6.6273	<0.0001
Industrials	−0.05786	−0.7512	0.4525	−0.04765	−0.6192	0.5357
Real Estate	−0.68122 ***	−6.7543	<0.0001	−0.67695 ***	−6.7208	<0.0001
Technology	0.80407 ***	8.7309	<0.0001	0.82149 ***	8.9307	<0.0001
Telecommunications	−0.09973	−0.7729	0.4395	−0.10027	−0.7775	0.4368
Utilities	−0.89746 ***	−8.2804	<0.0001	−0.89901 ***	−8.3049	<0.0001
SustC	−0.06188 *	−2.1284	0.0333	-	-	-
LinkTSR	-	-	-	0.12699 ***	3.8407	0.00012
No. of companies	5565			5563		
No. of observations	17,101	*Unbalanced panel*		17,006	*Unbalanced panel*	
No. of years	5	*Random effects*		5	*Random effects*	
Adj. R-Squared	0.0605			0.0611		
Chi-sq. (df = 14)	849.791 ***		<0.0001	859.04 ***		<0.0001
Breusch-Pagan LM (df = 1)	8517.9 ***		<0.0001	8461.1 ***		<0.0001

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$. Industry set as reference: *Basic Materials*.

When the binary variable *LinkTSR* is introduced in the model, *ITR* is no longer a significant predictor of *CASH*. This means that when it comes to the cash ratio, setting CEO incentives linked to total shareholder return (TSR) cancels the effect of integrated thinking and reporting. TSR is the overall appreciation in the stock price per share, plus any dividends paid by the company during the period. It represents an indicator of market performance which also refers to accounting measures of company performance (dividend yield). Executive incentives linked to shareholder return decrease financial risk to a much larger extent than ITR. Overall, hypothesis H_4 is confirmed by the estimation of models (4) to (9).

4.5. Robustness Tests for Model (2) with Company Grouping by SustC and LinkTSR

Robustness tests are applied to the most significant result in the present study, i.e., the relationship between *ITR* and *WACC*, specified in model (2). The results of t tests in Table 12 indicate that checking for robustness is necessary, considering that grouping the sample companies according to the type of CEO incentives adopted by companies would lead to significant differences in the estimation of model (2).

Table 12. Independent samples t tests for the classification according to *SustC* and *LinkTSR*.

	***SustC* = True**			***SustC* = False**			
Variable	**N**	**Mean**	**SD**	**N**	**Mean**	**SD**	**t Value**
ITR	4617	60.60	27.2	18,660	48.62	28.1	26.64 ***
LEV	4425	0.2987	0.153	17,656	0.2740	0.164	9.4531 ***
WACC	4702	0.0630	0.0293	20,504	0.0685	0.0302	−11.601 ***
CASH	4272	16.077	49.4	18,288	18.928	56.0	−3.308 ***
	***LinkTSR* = True**			***LinkTSR* = False**			
Variable	**N**	**Mean**	**SD**	**N**	**Mean**	**SD**	**t value**
ITR	10,051	55.31	28.0	13,101	47.76	28.1	20.324 ***
LEV	9925	0.3005	0.157	12,034	0.2612	0.163	18.086 ***
WACC	10,968	0.0641	0.0299	14,090	0.0702	0.0300	−16.317 ***
CASH	9119	22.2126	59.8	13,299	15.7493	50.8	8.4446 ***

*** $p < 0.001$. The reported statistic is Welch t test for unequal variances.

The estimations of model (2) for two groups of companies according to the adoption of CEO incentives linked to sustainability goals are presented in Table 13. This robustness test shows that, if the board has not (yet) implemented a sustainability-linked incentive system, a higher level of integrated thinking can still decrease the cost of capital. The results in Table 12 show that companies with a more developed ITR system have also implemented more complex remuneration systems (linked to sustainability goals and TSR). Therefore, the weighted average cost of capital is not significantly influenced by the actual level of integrated thinking and reporting (as measured by Refinitiv) for companies which have already adopted a high-level engagement and a holistic approach.

The estimations of model (2) for two groups according to the adoption of CEO compensation linked to TSR are presented in Table 14. Companies that have adopted an executive compensation system linked to shareholder value have a lower weighted average cost of capital, on average. For this group of companies, a higher level of integrated thinking and reporting can further reduce the cost of capital. However, companies that have not taken shareholder value into consideration when setting CEO remuneration criteria do not derive any significant benefit from a more developed ITR system, in terms of their average cost of capital. Our results show that there is an interplay between board oversight (materialized in the executive compensation scheme) and the development of the ITR system. In summary, stricter board oversight and holistic stakeholder management can decrease the average cost of capital and the financial risk for the company.

Table 13. Panel regression results for the weighted average cost of capital (*WACC)* as the dependent variable, with sample companies grouped by *SustC*.

Dependent: ***WACC***	**Model (2) for Group *SustC* = True**			**Model (2) for Group *SustC* = False**		
Factors	**Coeff.**	**Z-Value**	***p*-Value**	**Coeff.**	**Z-Value**	***p*-Value**
Intercept	0.22643 ***	20.2199	<0.0001	0.25436 ***	42.3521	<0.0001
ITR	0.000008596	0.4184	0.6756	−0.00002698 **	−2.7715	0.00558
Log(TA)	−0.002882 ***	−7.1149	<0.0001	−0.0027357 ***	−11.7891	<0.0001
Log(Gdppc)	−0.0087053 ***	7.5423	<0.0001	−0.011766 **	−35.0486	<0.0001
Rgrowth	−0.0097885 ***	−5.2125	<0.0001	0.0030511 **	3.2498	0.0011
Cons. Discretionary	−0.00392	−1.8734	0.0610	−0.0038679 **	−3.1031	0.0019
Cons. Staples	−0.017708 ***	−6.9227	<0.0001	−0.015076 ***	−10.3250	<0.0001
Energy	0.0043322	1.8188	0.0689	0.00506 **	3.0252	0.0024
Healthcare	−0.0093212 ***	−3.5230	<0.0001	−0.007391 ***	−4.9163	<0.0001
Industrials	−0.0034373	−1.7768	0.0756	−0.002999 *	−2.5159	0.0118
Real Estate	−0.020297 ***	−8.5176	<0.0001	−0.014454 ***	−9.8358	<0.0001
Technology	0.00045741	0.1663	0.8679	0.0013326	0.9611	0.3365
Telecommunications	−0.020728 ***	−6.1337	<0.0001	−0.001102 ***	−5.6088	<0.0001
Utilities	−0.027353 ***	−10.7167	<0.0001	−0.018951 ***	−11.2096	<0.0001
No. of companies	1734			5398		
No. of observations	3749	*Unbalanced panel*		14,735	*Unbalanced panel*	
No. of years	5	*Random effects*		5	*Random effects*	
Adj. R-Squared	0.1855			0.1850		
Chi-sq. (df = 13)	551.49 ***		<0.0001	1871.47 ***		<0.0001
Breusch-Pagan (df = 1)	329.13 ***		<0.0001	3237.8 ***		<0.0001

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$. Industry set as reference: *Basic Materials*.

Table 14. Panel regression results for the weighted average cost of capital (*WACC)* as the dependent variable, with sample companies grouped by *LinkTSR*.

Dependent: ***WACC***	**Model (2) for Group *LinkTSR* = True**			**Model (2) for Group *LinkTSR* = False**		
Factors	**Coeff.**	**Z-Value**	***p*-Value**	**Coeff.**	**Z-Value**	***p*-Value**
Intercept	0.21598 ***	23.3937	<0.0001	0.2634 ***	36.9962	<0.0001
ITR	−0.00004008 **	−2.7533	0.0059	0.00000094	0.0878	0.930
Log(TA)	−0.001677 ***	−5.5973	<0.0001	−0.003364 ***	−12.1835	<0.0001
Log(Gdppc)	−0.009637 ***	−13.7376	<0.0001	−0.011815 ***	−30.1998	<0.0001
Rgrowth	−0.014467 ***	−10.3809	<0.0001	0.011938 ***	11.9431	<0.0001
Cons. Discretionary	−0.007482 ***	−4.7826	<0.0001	−0.0011601	−0.7789	0.436
Cons. Staples	−0.02128 ***	−11.2117	<0.0001	−0.012422 ***	−7.2414	<0.0001
Energy	0.004441 *	2.3454	0.0190	0.003198	1.5297	0.126
Healthcare	−0.012813 ***	−6.6456	<0.0001	−0.004648 **	−2.5962	0.009
Industrials	−0.005941 ***	−4.0001	<0.0001	−0.001407	−0.9886	0.322
Real Estate	−0.021836 ***	−12.3373	<0.0001	−0.011636 ***	−6.4295	<0.0001
Technology	−0.006296 ***	−3.4073	<0.0001	0.0063188 ***	3.8265	0.0001
Telecommunications	−0.022523 ***	−8.7084	<0.0001	−0.0063006 **	−2.7215	0.006
Utilities	−0.028535 ***	−13.5633	<0.0001	−0.016397 ***	−8.2988	<0.0001
No. of companies	2853			3728		
No. of observations	7995	*Unbalanced panel*		10,391	*Unbalanced panel*	
No. of years	5	*Random effects*		5	*Random effects*	
Adj. R-Squared	0.1235			0.2298		
Chi-sq. (df = 13)	897.89 ***		<0.0001	1490.32 ***		<0.0001
Breusch-Pagan (df = 1)	450.96 ***		<0.0001	3502.6 ***		<0.0001

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$. Industry set as reference: *Basic Materials*.

5. Discussion and Conclusions

The findings of this study show a positive association between ITR and liquidity, and a negative link between the main predictor and the weighted average cost of capital. The

dependent variables are proxies for the financial risk of industrial and service companies. Thus, we provide insights into how ITR can reduce the financial risk of a company. Lower financial risk is equivalent to a higher cash ratio and a lower cost of capital and cost of debt, signaling reliable forecasting of future returns and avoidance of financial losses. The insights advance our understanding on the relationship between ITR and financial risk, as we introduce executive compensation variables to check if the results are robust. We extracted binary variables on the adoption of executive compensation linked to corporate social responsibility and CEO compensation linked to total shareholder return.

Different stakeholders may take into account our research, because it provides various theoretical and practical implications. Managers may adjust their reporting attitudes and preferences once they understand the positive effect that the ITR system has on the financial risk of large companies. Banks and other financing institutions have access to a higher level of transparency, and might require a lower return, by providing a more favorable interest to their debtors. Shareholders are better informed through the integrated reporting framework, allowing them to make more timely investment decisions. Lastly, regulators are focused on maximizing social welfare, and may have a less interventionist approach regarding those companies in which integrated thinking and reporting come as the tone at the top. Otherwise, standard-setters can arrange either incentive mechanisms or actions through which integrated reporting becomes mandatory if significant controls from authorities are implemented.

The empirical results of the present article indicate that integrated thinking and reporting significantly decrease the weighted average cost of capital for industrial companies and are significantly and positively associated with liquidity. Therefore, signaling theory is confirmed, as companies that reduce information asymmetry through the use of integrated reporting can also reduce their financial risk. It is noteworthy that the adoption of ITR does not have a significant relationship with leverage, which suggests that companies with a more developed ITR system do not, by default, reduce their appetite for debt. Also, the results suggest that long-term goals may put more pressure on the executive team to raise more cash from creditors to achieve strategic objectives. At the same time, a holistic approach to sustainable development supports the reduction of the cost of financing through debt and equity. Nevertheless, companies with a more developed ITR system have more complex remuneration schemes in place, linked to both sustainability goals and total shareholder return.

Such results may represent the starting point on improving the current regulations by introducing new requirements linked to sustainability in the remuneration schemes. In practice, when executive compensation packages are defined, the board of directors should take into account key performance indicators linked to financial risk, tolerable risk appetite, and sustainability targets, respectively.

This study has some particularities and possible limitations. First, the sample does not consider the financial services sector. A sample that would include the financial services sector would demand specific financial risk indicators other than leverage and the cash ratio. Second, we used data from Refinitiv Eikon which is subject to many quality audits performed by database administrators. As such, we assume the data is more accurate than hand-collected information. Finally, the sample included 7111 companies, after 16,549 companies pertaining to the financial services sector and 37,046 companies with missing data were excluded. This sample may be considered small compared to the population of companies analyzed by Refinitiv. However, if data cleaning had not been performed, our results would not have been robust.

Future analyses in the financial services sector may be useful in identifying the association between ITR and financial risk, considering specific indicators in line with reporting practices. Furthermore, future research regarding industrial companies may consider the period after 2021, to include the effects of new factors that have arisen in the post-pandemic period, such as the unusual increase in energy prices, a significant increase in inflation, and the effects of Russia's war in Ukraine.

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Appendix A

A fragment of R code pertaining to the panel estimation is presented below. The variable abbreviations are as in the text. The database *risks_panel* is a 'long' panel, where each company has five rows, for each year in the period 2017–2021.

Algorithm A1: Code selection in RStudio for panel estimation and LM test

```
# Panel regression LEV model (1)
model_LEV <- plm(LEV ~ ITR + log(TA) + log(Gdppc) + Rgrowth + Industry, data = risks_panel,
index = c("RIC", "wave"), model = "random")
summary(model_LEV)
# Breusch-Pagan Lagrange multiplier (LM)
pool1 <- plm(LEV ~ ITR + log(TA) + log(Gdppc) + Rgrowth + Industry, data = risks_panel,
index = c("RIC", "wave"), model="pooling")
plmtest(pool1, type=c("bp"))
```

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